# Alturas Groundwater Basin, South Fork Pit River Subbasin

- Groundwater Basin Number: 5-2.01
- County: Lassen, Modoc
- Surface Area: 114,000 acres (178 square miles)

## Basin Boundaries and Hydrology

The South Fork Pit River Groundwater Subbasin is bounded on the east by Plio-Pleistocene basalt and Pleistocene Pyroclastic rocks of the Warner Mountains, to the north by Pleistocene basalt of Devils Garden, to the south by Plio-Pleistocene basalt, and to the west by Warm Springs tuff (Gay 1968). The South Fork Pit River enters the basin near the community of Likely and flows north through the South Fork Pit River Valley to its confluence with the North Fork Pit at the town of Alturas. Annual precipitation ranges from 13- to 19-inches.

## Hydrogeologic Information

### *Water-Bearing Formations*

The principal water-bearing formations are Holocene sedimentary deposits (which include alluvial fan deposits, intermediate alluvium, and basin deposits), Pleistocene lava flows and near-shore deposits, and Plio-Pleistocene Alturas Formation and basalts. The following summary of water-bearing formations is from DWR (1963).

**Holocene Sedimentary Deposits.** The Holocene sedimentary deposits include alluvial fan deposits, intermediate alluvium, and basin deposits - each up to a thickness of 75 feet. Alluvial fan deposits consist of unconsolidated to poorly consolidated, crudely stratified silt, sand and gravel with lenses of clay. These deposits generally have high permeability and are capable of yielding large amounts of water to wells. This unit may include confined as well as unconfined water.

Intermediate alluvium consists of unconsolidated poorly sorted silt and sand with some lenses of gravel. These deposits have moderate permeability and yield moderate amounts of water to shallow wells.
Basin deposits consist of unconsolidated, interstratified clay, silt and fine sand. These deposits have moderate to low permeability and yield small amounts of water to wells.

**Pleistocene Near-Shore Deposits.** The Pleistocene near-shore deposits consist of slightly consolidated to cemented, poorly to well stratified pebble and cobble gravel with lenses of sand and silt to a thickness of 200 feet. The most extensive near-shore deposits occur in the northeast corner of the basin where the North Fork Pit River enters the valley. Other minor areas of these deposits occur but are not considered significant as water-bearing areas. These deposits have moderate permeability and may yield fair to moderate amounts of unconfined and confined water to wells.

**Pleistocene and Plio-Pleistocene Volcanic Rocks**. The Pleistocene volcanic rocks consist of lava flows of layered, jointed basalt ranging in thickness

from 50- to 250-feet. These basalt flows serve as recharge zones where exposed in the uplands surrounding the basin. Within the basin, where saturated, scoriaceous zones and joints in the basaltic flows can yield moderate amounts of water to wells. These flows occur interbedded with the upper member of the Alturas Formation in the valley areas.

**Plio-Pleistocene Alturas Formation**. The Plio-Pleistocene Alturas Formation consists of moderately consolidated, flat-lying beds of tuff, ashy sandstone and diatomite, and are widespread both at the surface and at depth. The upper and lower sedimentary members of the formation are each about 400 feet thick, and are separated by a basalt member and the Warm Springs tuff. The sediments of the Alturas Formation are the principal water-yielding materials in the South Fork Pit River subbasin. These sediments have a moderate to high permeability and, where saturated, can yield large amounts of groundwater to wells. The formation contains both confined and unconfined groundwater.

### *Restrictive Structures*

Exposures of Warm Springs tuff in Sections 10 and 15, Township 42 North, Range 11 East, act as a partial barrier to the westward movement of groundwater from South Fork Pit River Valley to Warm Springs Valley (DWR 1963).

### *Groundwater Level Trends.*

Water levels generally declined up to 10 feet in the northern part of the basin during the period from the early 1980's through the early 1990's and have recovered to former levels through 1999.

### *Groundwater Storage*

**Groundwater Storage Capacity.** The groundwater storage capacity to a depth of 800 feet is estimated to be approximately 7,500,000 acre feet for the entire Alturas Groundwater Basin (including the South Fork Pit River Subbasin and the Warm Springs Valley Subbasin) (DWR 1963).

### *Groundwater Budget (Type B)*

Estimates of groundwater extraction are based on surveys conducted by the California Department of Water Resources during 1997. Surveys included land use and sources of water. Estimates of groundwater extraction for agricultural, and municipal/industrial uses are 13,000, and 260, acre-feet respectively. Deep percolation of applied water is estimated to be 9,600 acre-feet.

### *Groundwater Quality*

**Characterization**. Sodium bicarbonate and sodium-calcium bicarbonate type waters are the predominant water types in the basin. The concentration of total dissolved solids ranges between 180- to 800-mg/L, averaging 357 mg/L (DWR unpublished data).

**Impairments.** Some wells in the Alturas Groundwater Basin have high concentrations of total dissolved solids, nitrate, iron, or boron (DWR 1963).

## Well Characteristics

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|---|---|---|
| | **Well yields (gal/min)** | |
| Irrigation | Range: 55 – 5000 | Average: 1075 (82 Well Completion Reports) |
| | **Total depths (ft)** | |
| Domestic | Range: 34 –750 | Average: 218 (356 Well Completion Reports) |
| Irrigation | Range: 90 – 1029 | Average: 493 ( 82 Well Completion Reports) |

## Active Monitoring Data

| Agency | Parameter | Number of wells /measurement frequency |
|---|---|---|
| DWR | Groundwater levels | 8 wells semi-annually |
| DWR | Miscellaneous Water Quality | 8 wells biennially (including both Subbasins 5-2.01 and 5-2.02) |
| Department of Health Services | Miscellaneous Water Quality | 8 |

## Basin Management

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| Groundwater management: | Modoc County adopted a groundwater management ordinance in 2000. |
| Water agencies | |
| Public | City of Alturas, California Pines Community Service District, Hot Springs Valley Irrigation District. |
| Private | |

## Selected References

California Department of Water Resources. 1960. Alturas and Warm Springs Valley Basins. California Department of Water Resources, Division of Resource Planning.

California Department of Water Resources. 1960. Northeastern Counties Investigation. California Department of Water Resources. Bulletin 58.

California Department of Water Resources. 1963. Northeastern Counties Groundwater Investigation, Volume 1, Text. California Department of Water Resources. Bulletin 98. 224 p.

California Department of Water Resources. 1965. Northeastern Counties Ground Water Investigation, Appendix C, Geology. California Department of Water Resources, Northern District. Bulletin 98.

California Department of Water Resources. 1963. Northeastern Counties Investigation, Volume 2, Plates. California Department of Water Resources. Bulletin 98.

California Department of Water Resources. 1986. Alturas Ground Water Basin, Water Quality Study. California Department of Water Resources, Northern District.

Gay TE, Jr., Aune QA. 1968. Geologic Map of California [Alturas Sheet]. California Division of Mines and Geology Geologic. Atlas.

## Bibliography

Bailey EH. 1966. Geology of Northern California. California Division of Mines and Geology. Bulletin 190.

California Department of Water Resources. 1964. Quality of Ground Water in California 1961-62, Part 1: Northern and Central California. California Department of Water Resources. Bulletin 66-62.

California Department of Water Resources. 1975. California's Ground Water. California Department of Water Resources. Bulletin 118.

California Department of Water Resources. 1980. Ground Water Basins in California. California Department of Water Resources. Bulletin 118-80.

California Department of Water Resources. 1982. Northeastern Counties Ground Water Update. California Department of Water Resources, Northern District. Office Report.

California Department of Water Resources. 1992. Lassen County Water Resources Assessment Study. California Department of Water Resources, Northern District. Memorandum Report.

Dickinson WR, Ingersoll RV, Grahm SA. 1979. Paleogene Sediment Dispersal and Paleotectonics in Northern California. Geological Society of America Bulletin 90:1458-1528.

Kramer JC. 1980. California Department of Water Resources Progress Report: Groundwater Condition Update, Northeast Counties, July 8, 1980, Plus Some Department of Water Resources Bulletin 98

Statigraphic Columns and Cross Sections for Northeastern Counties, Geologic Guide to the Modoc Plateau and the Warner Mountains. Geological Society Sacramento: 124-148.

Planert M, Williams JS. 1995. Ground Water Atlas of the United States, Segment 1, California, Nevada. USGS. HA-730-B.

US Geological Survey. 1981. Water Resources Data for California; Volume 4, Northern Central Valley Basins and the Great Basin from Honey Lake Basin to Oregon State Line. US Geological Survey

## Errata

Changes made to the basin description will be noted here.